



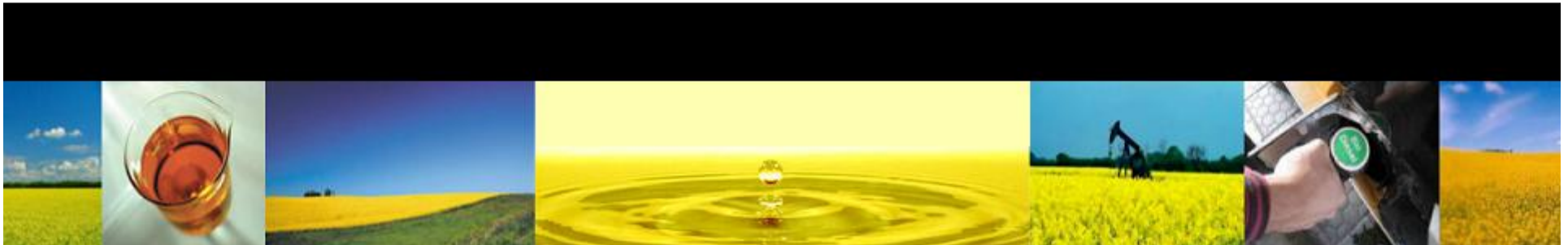
Bio Fuels Today

Working With Today's Alternative To Fossil Fuels



Topics

- Information Challenges
- Product Challenges
- Where Do We Go From Here





Bio Fuels Today

Information Challenges



Political





Bio Fuels Today

Information Challenges



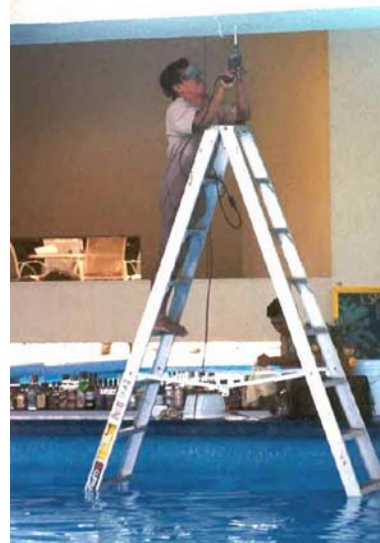
Performance Myths





Bio Fuels Today

Information Challenges

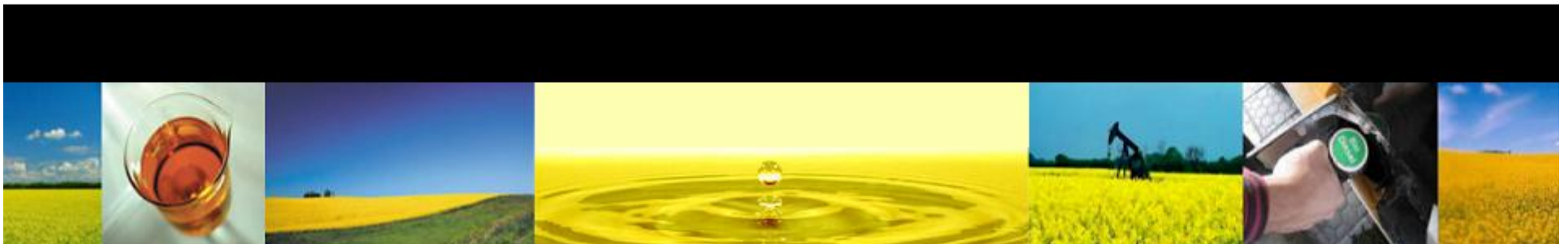


Learning Curve



What is Ethanol?

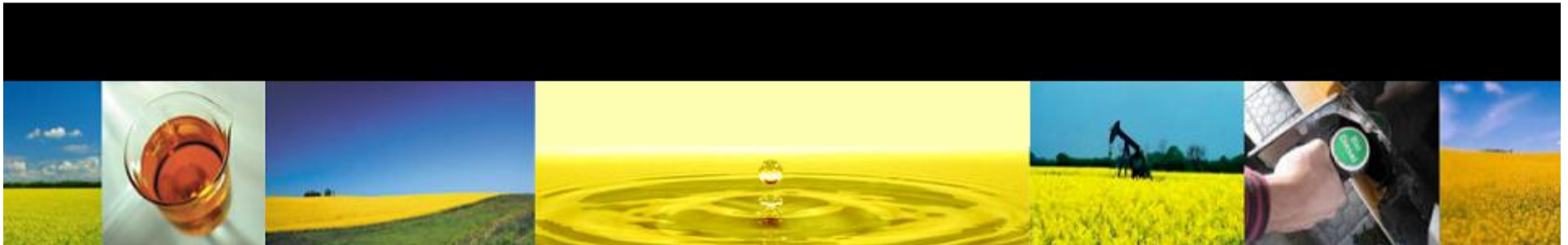
- Ethanol (ethyl alcohol or grain alcohol) is a clear, colorless liquid with a characteristic, agreeable odor. In dilute aqueous solution, it has a somewhat sweet flavor, but in more concentrated solutions it has a burning taste. Ethanol, $\text{CH}_3\text{CH}_2\text{OH}$, is an alcohol, a group of chemical compounds whose molecules contain a hydroxyl group, $-\text{OH}$, bonded to a carbon atom.





Facts About Ethanol

- Regardless of the blend level, the quality of the ethanol added to gasoline is important. The industry standard for ethanol is **ASTM D 4806** Standard Specification for Denatured Fuel Ethanol for Blending with Gasoline for Use as Automotive Spark Ignition Engine Fuel.

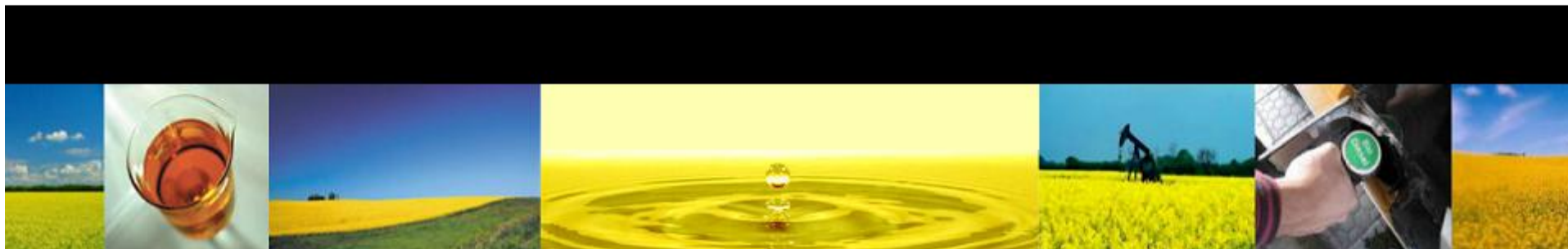
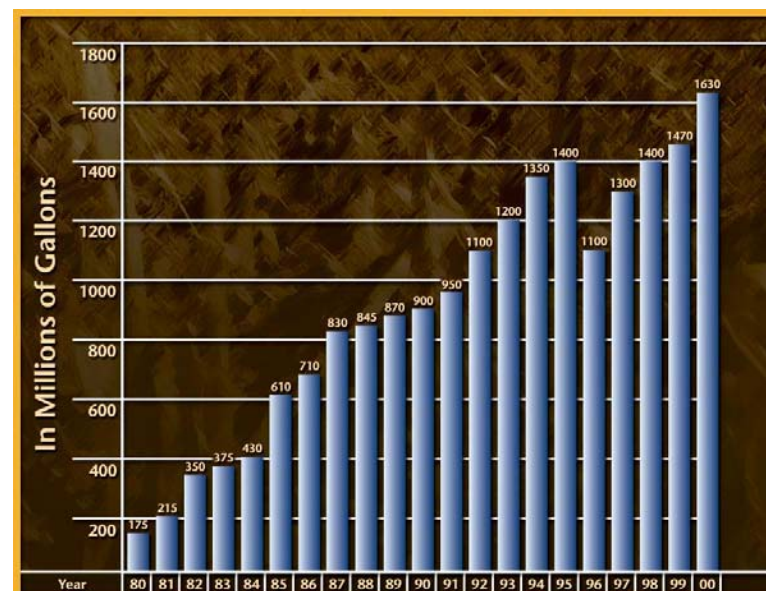




Bio Fuels Today

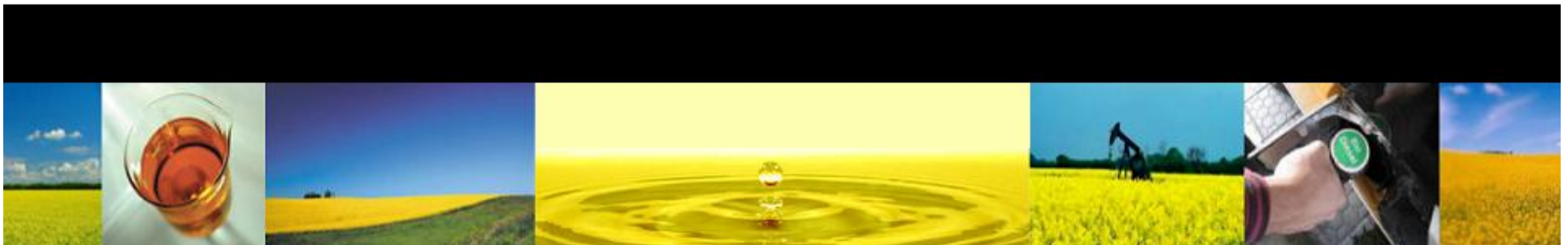
Facts About Ethanol

- **Ethanol** was 2% of the U.S. motor gasoline sales.
- **Ethanol** blends up to 10% are approved by all the major auto manufactures
- 74 percent of the gasoline sold in Iowa last year contained a 10 percent ethanol blend,
- Sales of E85 tripled last year
- There are about 100,000 vehicles in Iowa with the capacity to operate on E85



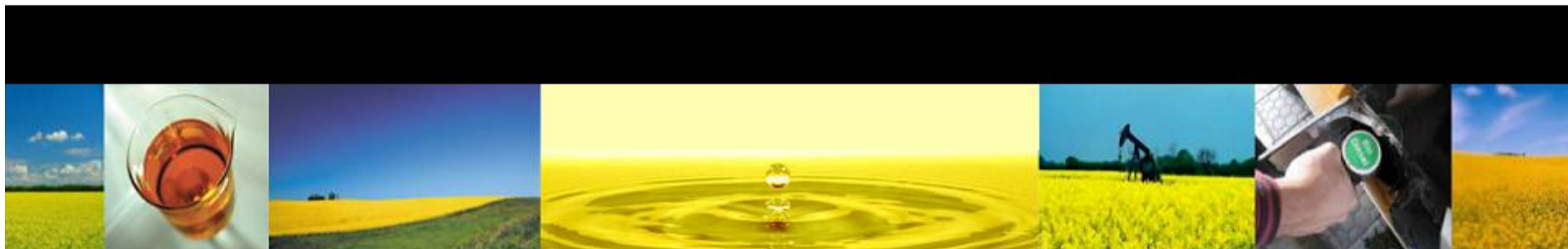
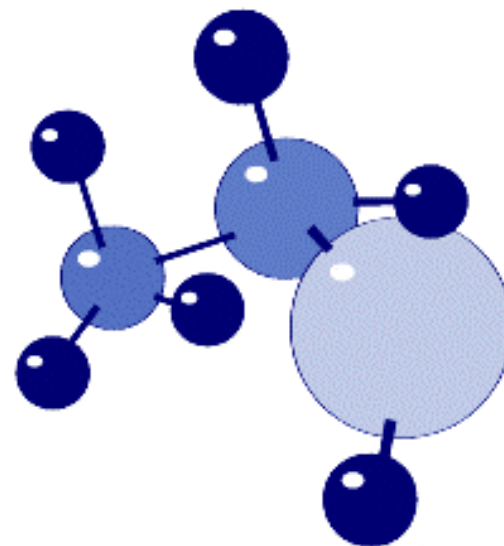
Facts About Ethanol

- Ethanol conducts electricity
- Although E85 use may be lower in some pollutants, E85 fuel is poisonous and flammable.
- E85 should never be confused with beverage alcohol.
- Cigarettes and other open ignition sources should never be allowed in fueling areas.



What is BioDiesel?

- **Biodiesel** is the pure, or 100 percent, biodiesel fuel. It is referred to as B100 or "neat" biodiesel.
- **Biodiesel** is Vegetable Oil Methyl Ester. Biodiesel can be made from methyl, ethyl, isopropyl, and other alcohols, but most biodiesel research focuses on methyl esters and virtually all commercial-production in the United States today uses methyl esters.



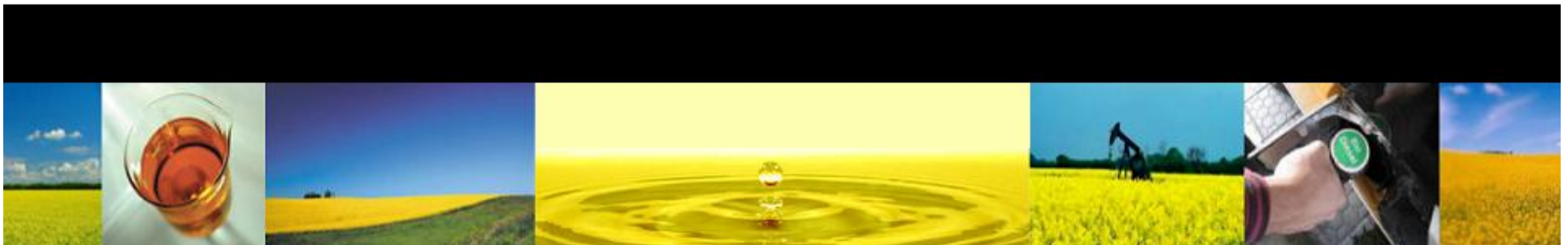
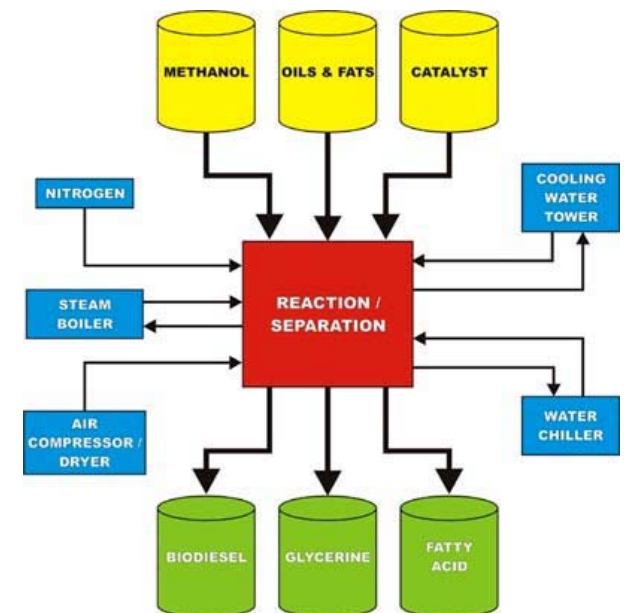
BioDiesel Feedstocks

- Soy bean oil
- Vegetable oil
- Cottonseed oil
- Olive oil
- Rape seed oil
- Corn oil
- Sunflower oil
- Mustard oil
- Peanut oil
- Canola oil
- Coconut oil
- Animal fats
 - * Chicken fat
 - * Leather fat
- Waste cooking oils
 - * Used frying oil
 - * Float grease
 - * Trap grease (yellow grease)



Facts About BioDiesel

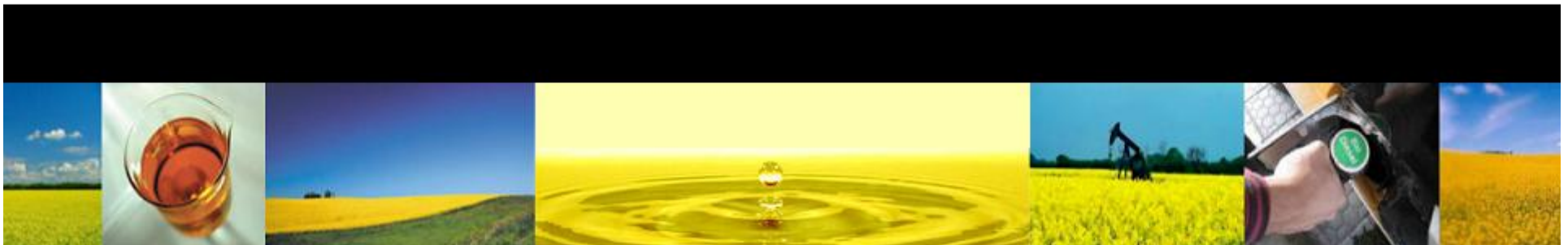
- Around since 1994
- 100 lbs of “oil” + 10 lbs of methanol = 100 lbs of biodiesel + 10 lbs of glycerol
- A “***biodiesel***” ***blend*** is pure biodiesel blended with petrodiesel.
 - * ***B2*** blend is 2% biodiesel & 98% petrodiesel
 - * ***B5*** blend is 5% biodiesel & 95% petrodiesel
 - * ***B20*** blend is 20% biodiesel & 80% petrodiesel
 - * ***B100*** blend is 100% biodiesel
- The considerations for B100 are very different than lower biodiesel blends





Facts About BioDiesel

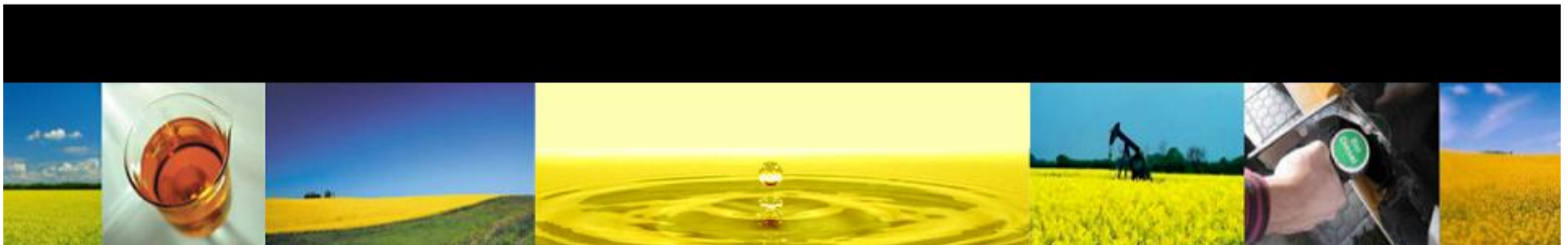
- The definition of biodiesel contained in ASTM D6751, along with the physical and chemical property limits, eliminates certain “biofuels” that have been incorrectly called biodiesel in the past.
- Do not be fooled by other so-called “**biodiesel**” products
- Ensure the biodiesel meets the ASTM specification for pure biodiesel (ASTM D 6751) before blending with petrodiesel





Facts About BioDiesel

- Biodiesel supports the growth of bacteria; I.e. algae
- Biodiesel raises the cold weather properties at least 3° F or petrodiesel
- Biodiesel is a good solvent
- Biodiesel has a 6-months shelf life
- B20 has the same handling properties as petroleum diesel. While B100 or "neat" (100%) biodiesel, it may be treated the same as for the storage of vegetable oil.





Facts About BioDiesel

- Look for “Accredited Producers” and “Certified Distributors” accredited by the National Biodiesel Accreditation Commission’s BQ9000 program



Ethanol Incompatibles

Metals

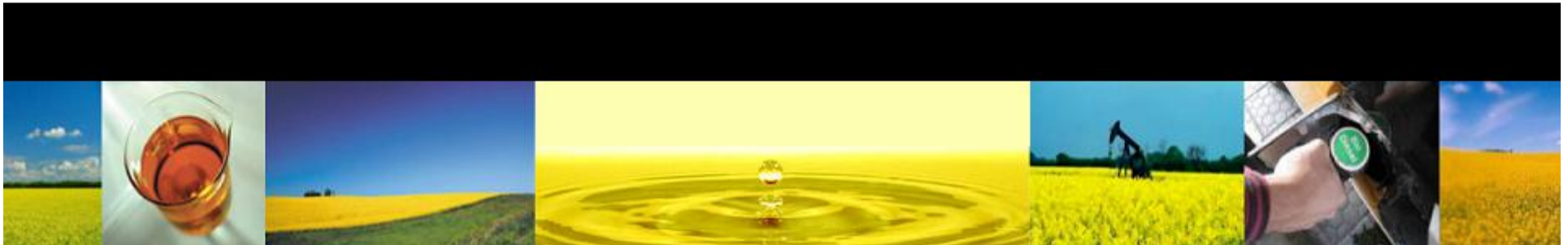
- Aluminum
- Brass
- Copper
- Lead
- Plated Steel
- Pb solder
- Zinc

Elastomers

- Natural rubber
- Leather gasket material
- Cork gasket material)

Polymers

- Polyurethane
- PVC
- Alcohol-based pipe dope



Ethanol Compatibles

Metals

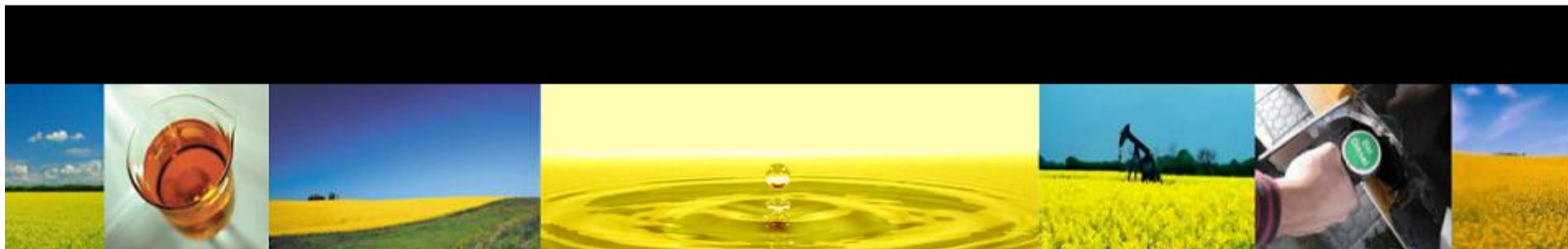
- Unplated steel
- Anodized aluminum
- Black iron
- Bronze
- Carbon steel
- Nickel plated
- Stainless Steel

Elastomers

- Buna-N (hose & gaskets)
- Teflon
- Fluorosilicone
- Neoprene
- Nitrile
- Polysulfide rubber
- Viton (fluorocarbons)

Polymers

- Acetal
- Nylon (Polyamide)
- Polypropylene
- Teflon
- Thermoset plastics
- Fiberglass reinforced plastic



BioDiesel Incompatibilities

Metals

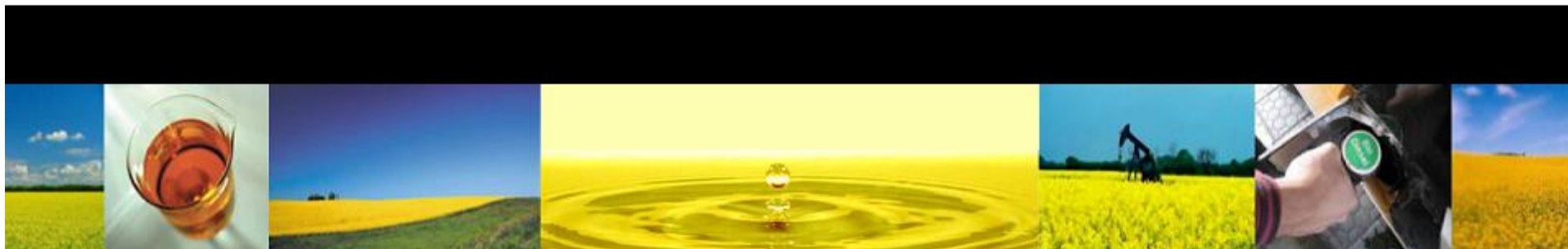
- Copper
- Brass
- Bronze
- Lead
- Tin
- Zinc (galvanizing)

Elastomers

- Buna-N (hose & gaskets)
- Nitrile
- Natural rubber

Polymers

- Plastics
- Polyvinyl



BioDiesel Compatibilities

Metals

- Black iron
- Carbon steel
- Aluminum
- Stainless Steel

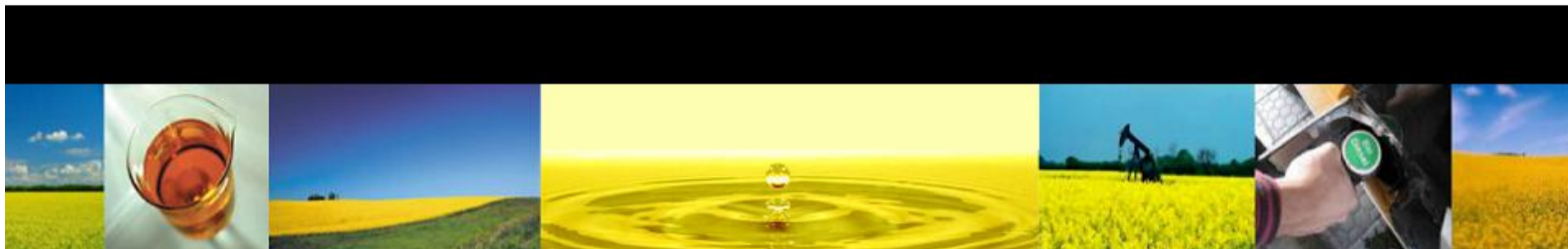
Elastomers

- Viton
- Teflon
- Nylon

Polymers

- Polyethylene
- Polypropylene
- Acryl & Epoxy

A considerable amount of experience exists in the US with a 20% blend of biodiesel with 80% diesel fuel (B20). Although biodiesel (B100) can be used, blends of over 20% biodiesel with diesel fuel should be evaluated on a case-by-case basis until further experience is available.





Information Challenges

*Manufacturer
Curve*



Information Challenges

*Regulatory
Curve*

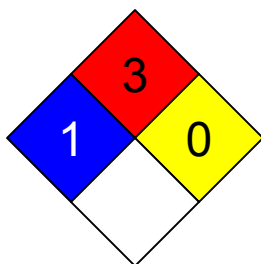




Regulatory - Ethanol

E-10 & E-85

1 Health
3 Flammability
0 Reactivity
Protective Equip



- Must comply with the National Fire Protection Agency (NFPA) codes. NFPA Codes 30 and 30A.
- *Federal Spill Prevention, Control and Countermeasures (40 CFR, Part 112);*
- *State "spill" requirements;*
- *Hazardous waste regulations;*
- *State and local fire codes;*
- *Petroleum product delivery laws; and*
- *Local fire marshals may also need to approve your fueling site design and installation*

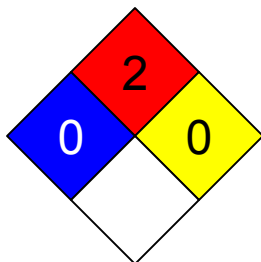




Regulatory - BioDiesel

B20 (125-180°F)

0 Health
2 Flammability
0 Reactivity
Protective Equip



FLAMMABILITY (Red)

4 – SEVERE HAZARD - *Flash Point Below 73°F (C1A):*

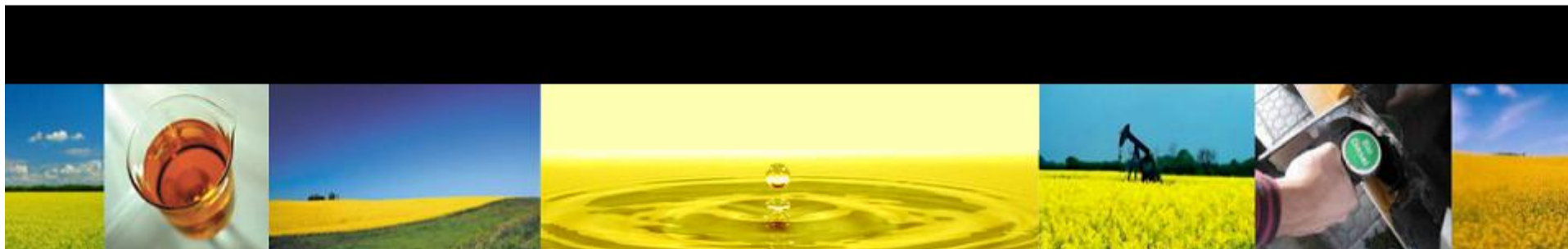
Very flammable, volatile or explosive depending on its state.

3 – SERIOUS HAZARD - *Flash Point Below 100°F (C1B):*
Flammable, volatile or explosive under almost all temperature conditions.

2 - MODERATE HAZARD - *Flash Point Below 200°F:*
Moderately heated conditions may ignite this substance.

1- SLIGHT HAZARD - *Flash Point Above 200°F:*
This substance must be preheated to ignite.

0- MINIMAL HAZARD - *Will Not Burn:*
Substances that will not burn.

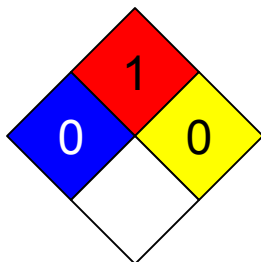




Regulatory - BioDiesel

B100 (266°F)

0 Health
1 Flammability
0 Reactivity
Protective Equip



NFPA CLASSIFICATIONS OF LIQUIDS

CLASS IA - Flash Point <73°F Boiling Point <100°F

CLASS IB - Flash Point <73°F Boiling Point >100°F

CLASS IC - Flash Point >73°F Boiling Point <100°F

CLASS II - Flash Point >100°F & <140°F

CLASS IIIA - Flash Point >140°F & <200°F

CLASS IIIB - Flash Point >200 °F

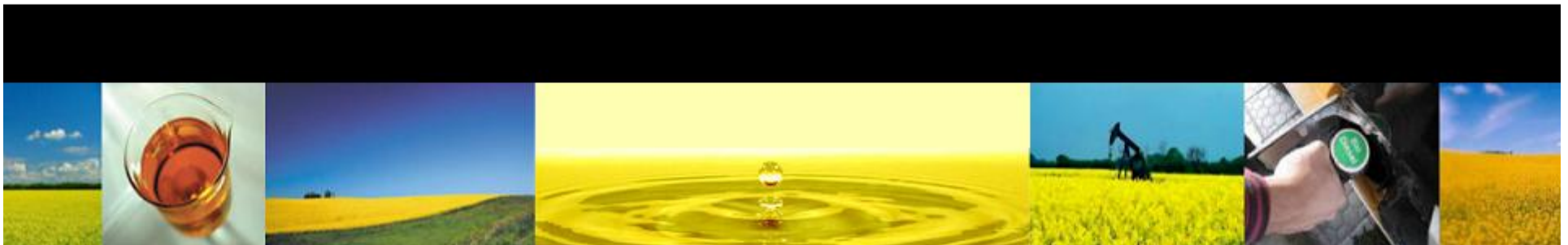




Where Do We Go From Here

Transition to Bio Fuels (Four Step Process)

- Evaluate the current equipment
- Implement
- Prepare to sell biofuels
- Maintenance & Upkeep

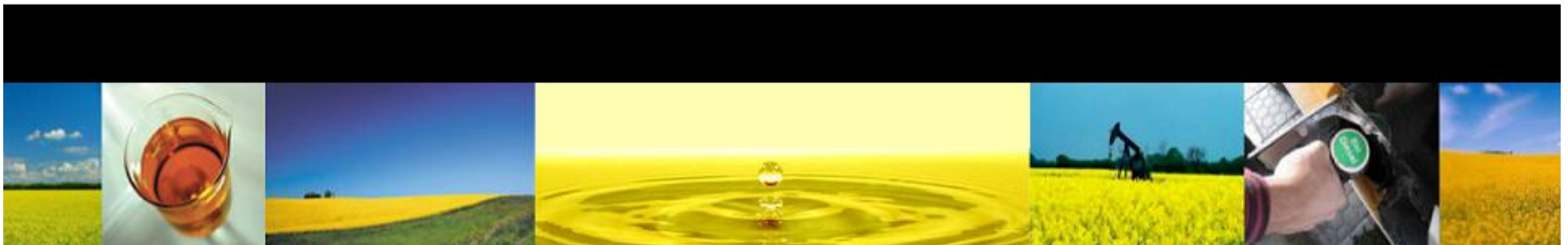




Where Do We Go From Here

Transition to Bio Fuels *(Four Step Process)*

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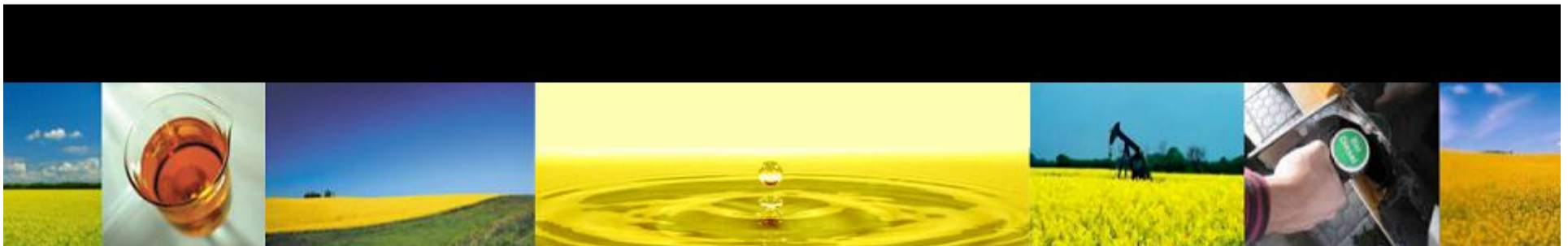




Compatibility – Tanks

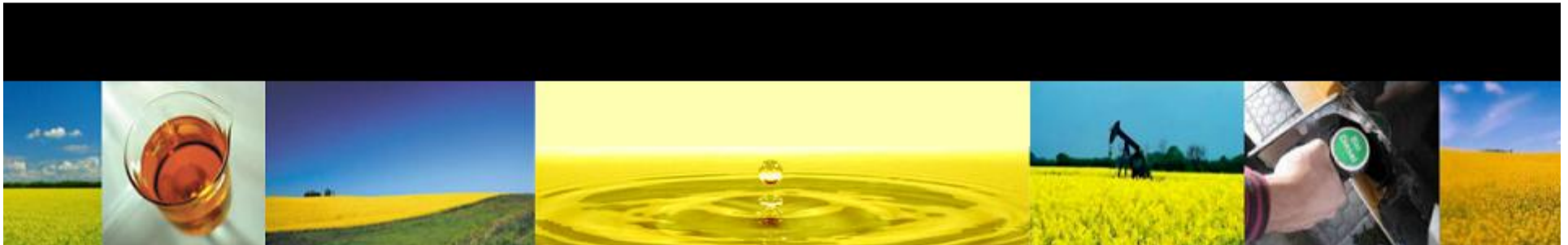
- **Mild steel tanks:** compatible unless there is water in the tank, if a corrosion problem exist, it will exasperate an existing problem.
- **Post-1992 single-walled fiberglass USTs** may be used with E85 when approved by Underwriters Laboratories, Inc.
- **FRP – pre 81 tanks:** questionable for any alcohol, OC did not reinstate warranties. These tanks are not UL listed.
- **Retrofit Linings:** no linings if using E-85. E-10 should be checked for manufactures certification for the products stored.
- **Jacketed tanks:** Need to check UL listing.

Most tanks designed to store diesel fuel will store B100 with no problem. Acceptable storage tank materials include aluminum, steel, fluorinated polyethylene, fluorinated polypropylene, Teflon®, and most fiberglass.



Compatibility – Tank Fittings

- **Spill Containment:** Insure that it has no aluminum components are present.
- **Overfill Prevention:**
 - * *Ball valve: will the vapors degrade the ball itself.*
 - * *Automatic shut off at drop tubes: Would have to be nickel plated, or made of other compatible material.*
- **Drop Tubes:**
 - * *Would need to be nickel plated or made of compatible material. Tubes would have to sized before it is plated.*





Bio Fuels Today

Compatibility – Tank Fittings

ONE COMPANY. ONE WORLD. ONE SOURCE.™

ETHANOL?... NO PROBLEM!
INTRODUCING THE NEW E11 SERIES NOZZLES

Listed Nozzles for E85/E100 Service... Only From OPW

OPW

OPW has a complete line of ethanol compatible products for all your fueling applications

Introducing the Complete E85 Ethanol System Solution by OPW

Today 3.5 million vehicles in the U.S. can run on E85 fuel, and with the passage of the new energy bill, this number is expected to increase significantly. E85 is a blend of 85 percent ethanol and 15 percent ordinary unleaded gasoline. It is rapidly becoming a major alternative fuel and stands to gain significant consumer acceptance to combat rising fossil fuel costs.

But – a word of caution – E85 fuel requires special handling by fueling components specifically designed to:

- Protect above ground and underground fueling systems
- Protect dispensers, hanging hardware and prevent nozzle problems

OPW offers the most extensive E85 compatible fueling solution in the industry. Our E85 compatible products contain nickel plating and special elastomers to make sure your equipment is protected against corrosion and your fuel is protected against system contamination.

When it comes to fueling, rely on the brand and experience more marketers trust around the world than any other – OPW.

OPW E85 Ethanol Compatible System Solution

All OPW components are designed, built and tested to work together as a unified system solution for E85 and E100.

1. Overfill Prevention Valves	6150M Series	19. Conventional Nozzles	11AP 0402
2. Spill Containment Modules	1200 Series	20. Conventional Nozzles	11BP 0402
3. Extractor Fittings	233 Series	21. Conventional Breakaways	600 0402
4. Ball Floats	610M/300M Series	22. Conventional Sumps	24TPS 0402
5. Monitoring Caps	610M Series	23. PSCS: Simple and Double Wall Flexible Pipe	All Product Nos.
6. Low Profile Vapor Caps	1711PC-0100	24. PSCS: Easy Fitting and Primary Pipe Fittings	All Product Nos.
7. Low Profile Fuel Caps	6141PC-0100	25. Remote Fuel AST Spill Containers	171 0402
8. Vapor Caps	1711F 700L EVO	26. AST Tank Alarms	140/0404A
9. Fuel Caps	6141F 700L EVO	27. Safety Check Valves	175 Series/175
10. Brexco Vapor Adapters	6114A/B 30S	28. Mechanical Tank Closures	20070
11. Brexco Vapor Seal Adapters	6154A/B 100L EVO	29. AST Overfill Prevention Valves	6151TOP/100M/0100/050A
12. Brexco Fuel Adapters	611T 6070	30. Coupler, Adapters, Over Caps and Over Flaps	6151H Series
13. Brexco Fuel Seal Adapters	6154A/B 100L EVO	31. Overfill Fuel Spill Containers	214CT/171ACT Series
14. 10 Emergency Shut Off Valves	All 10 Series Products	32. Top-Up Top-Up Adapters and Caps	6130A/0101/171 Series
15. Stainless Steel Hose Connectors	61FCX/XX00	33. Emergency Vents	20120 Series
16. Precision Vacuum Vents	612V & 612V Series	34. Anti Siphon Valves	190 Series
17. Balance Nozzles	110F 0402	35. Fuel Pans, Two-Way Ball Valves	110
18. Balance Breakaways	04CL 0402	36. Extended AST Emergency Shut Off Valves	1705

OPW

North America Toll Free: 1-800-451-0000 • Fax: 800-451-0000 • Email: usa@opw.com
 International: TEL: 001-415-415-0000 • Fax: 001-415-415-0000 • Email: usa@opw.com
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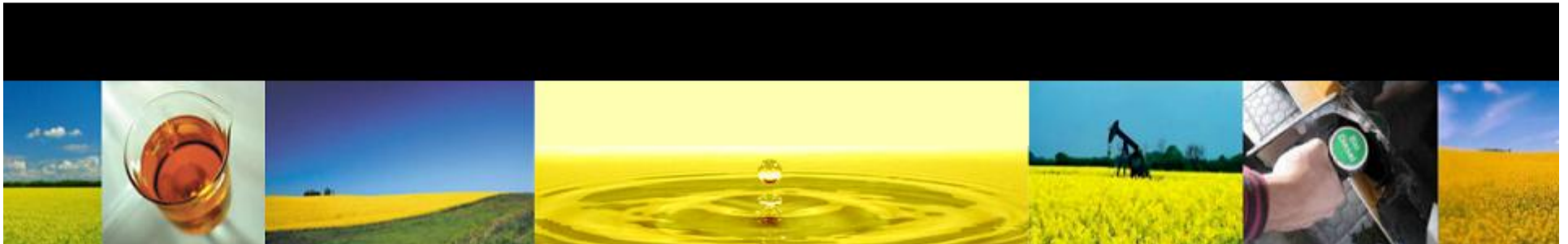
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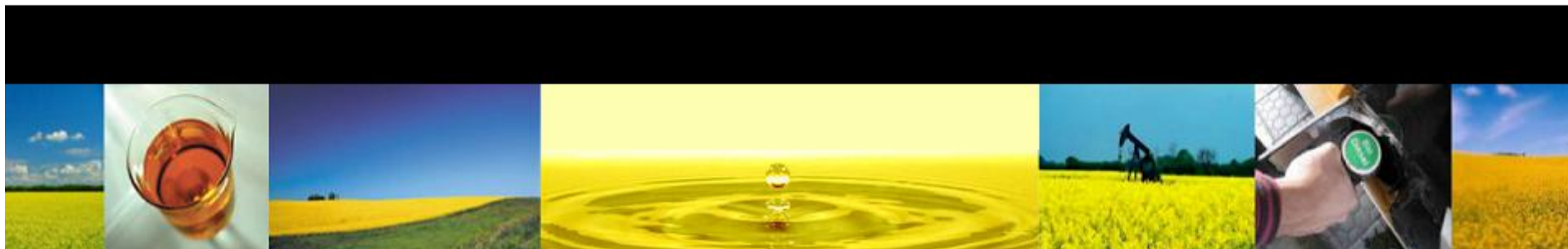
Compatibility – Tank Monitors

- **Probe Compatibility:**
 - * *Capacitance probes not usable with any level alcohol.*
 - * *Magnetostrictive probes components, stainless steel probes & check float.*
- **Manual Tank Gauging:**
 - * Compatible paste or other level finding product would have to be used
- **Interstitial Monitoring:** Sensors would have to be compatible. Many micro float switches are not compatible.



Compatibility – Dispensers

- Dispensers need to meet NFPA 30A by being UL listed. Retrofitting may void UL listing.
- UL 87 defines dispenser design, but UL has not updated the standard for E-85 or biodiesel above 20
 - Cited lack of test protocol/definition for compatibility
 - Little market demand kept it off the front burner
- Standard equipment is compatible to 15% ethanol; meters for neat ethanol should have internal o-rings and seals designed to withstand ethanol's solvent action.
- Standard equipment is compatible to 20% biodiesel; unless there is an issue with specific elastomers that are not compatible with B20.

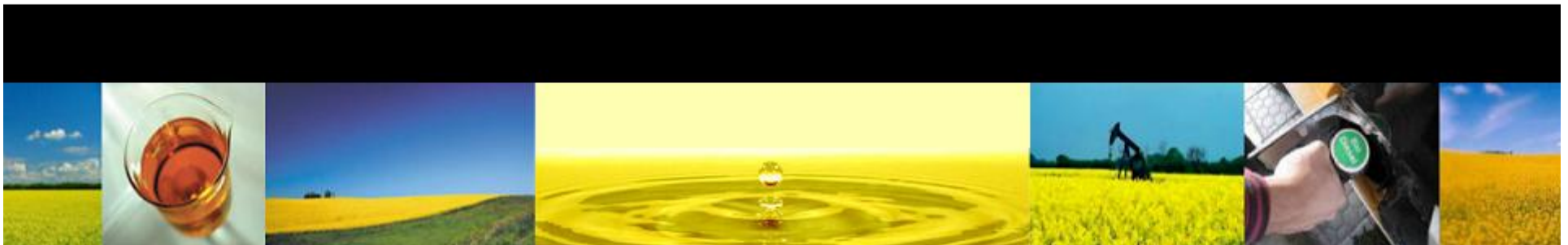




Compatibility – Dispensers

- The DNR and Fire Marshall Division require dispensers to bear the UL Mark or be certified by the manufacturer as compatible with the product stored and dispensed. Currently there are no E-Blend compatible dispensers with a UL Listing Mark. Therefore, incompatible dispensers are allowed a two-year phase-in period for E-Blend use.

Deadline for determining compatibility is 1 July 2007.





Compatibility – Dispensers

- CLEAN FUELS TECHNOLOGY (CFT) (September, 2005) submitted to Underwriters Laboratories, Inc. a fully compatible E85 dispenser and will continue to work for a listed device to comply with UL 87 (modified to accept E85).
- CFT is working directly with Dresser Wayne to provide a converted OEM dispenser fully compatible for E85 and also listed by UL.





Bio Fuels Today

Compatibility – Dispensers

- Dresser Wayne is jointly working with CFT to develop E85-compatible dispensers which meet UL safety standards and are type-approved by NIST for market availability **first quarter 2006**
- Gilbarco has met the NTEP standards for measurement accuracy of E85 fuel in the Encore product line and holds a Certificate of Conformance in conjunction with our contract alternative fuel partner CFT. It is our intention to move forward next with UL approval and meet the Iowa deadline for compatibility **before the 2007 deadline**.

The brochure features a large image of a blue and white Dresser Wayne E85 dispenser. Text on the page includes: 'Introducing Dresser Wayne's E85 Fuel Dispensers', 'The only approved retail dispensers for E85', 'What is E85?', 'How many E85 vehicles are currently in use?', 'Why should I become an E85 retailer?', and 'Dresser Wayne offers a full line of retail and commercial E85 dispensers'. Logos for E85, CLEANFUELUSA, and NIST are also present.



Compatibility – Dispensers

- Must use iron, unplated steel, or stainless steel, nickel plating or hard anodizing in the fuel path.
 - All castings
 - All hydraulic components
 - All fuel piping
- Seals & o-rings must be upgraded to Viton GFLT



Fuel control valve



Fluid piping and seals

Affected Hydraulics



Compatibility – Dispensers

- In the case of vane-type pumps, avoid impellers made from soft metals (zinc, brass, lead, aluminum).
- Steel or an engineering polymer with a high chemical resistance will give excellent results.

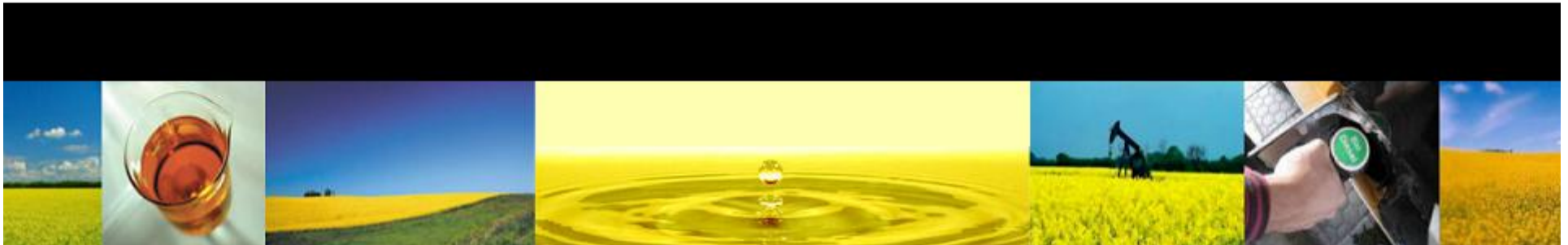


Fuel meter



Manifolds and fittings

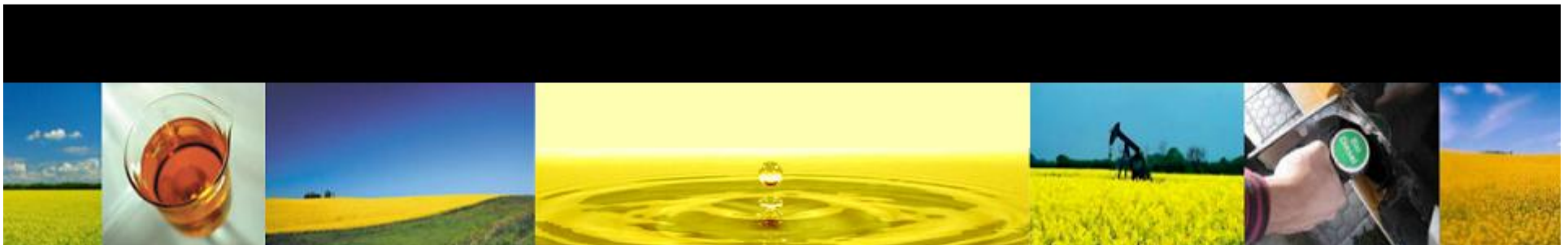
Affected Hydraulics





Compatibility – Hose

- Teflon-lined hose with stainless steel ends and fittings
- Studies conducted for the National Biodiesel Board on the materials compatibility of Biodiesel concluded that the only hose and gasket material that was truly resistant to the solvent effects of methyl esters was Viton.
- Has to be UL listed for the application.





Compatibility – Nozzles

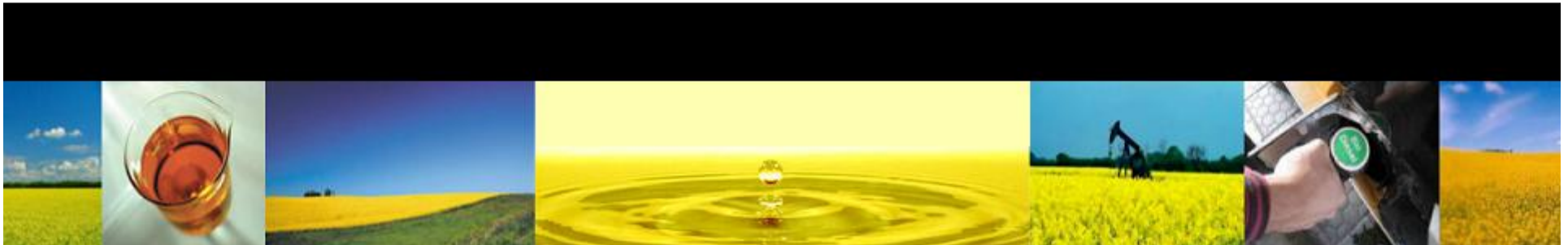
- Aluminum nozzles should not be used with E85, and nozzles made from any aluminum alloy must be used with caution.
- A nickel-plated nozzle is the best choice.
- Must be compatible
- Have to UL listed for E-85.





Compatibility – Hanging Hardware (Swivel, Breakaway, Spacer Hose)

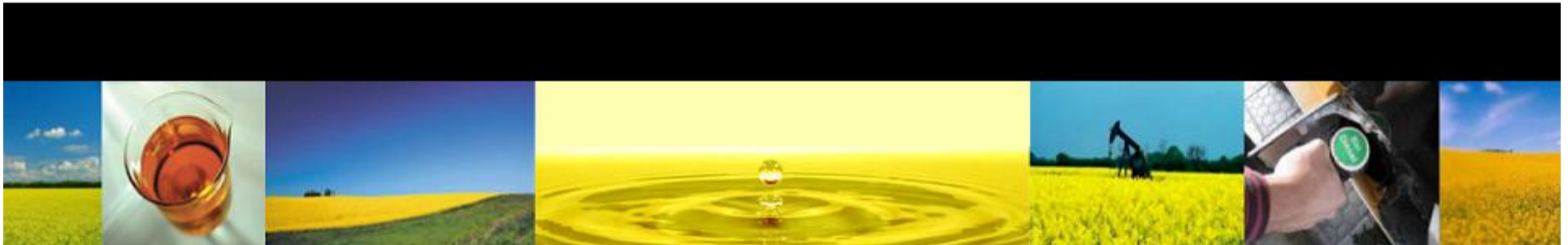
- Must be compatible
- Have to UL listed for E-85.





Compatibility – Filters

- E-85 Applications: 1-micron filter
- B-20 Applications: 2-micron filter
 - * Due to gelling in colder climates, a 10-micron may be required.*



Compatibility – Pumps

- **Suction pumps:**
 - * Impellers, veins, gaskets
 - * For denatured ethanol, the preferred materials for seals are carbon and ceramic. Teflon impregnated packing materials are recommended for packing construction.
- **Submersible pumps:**
 - * Made for E-85: o-rings, impellers and turbine .





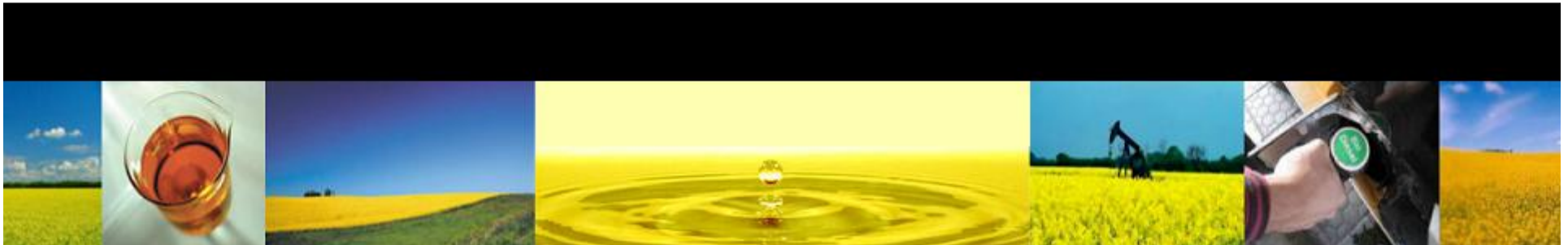
Compatibility – Leak Detectors

- **Mechanical Line Detector:**
 - * Red Jacket FX1 is not compatible must be of the FXV series.
 - * Would have to be certified for the product
 - * Would need to be UL Listed for the product



Compatibility – Piping

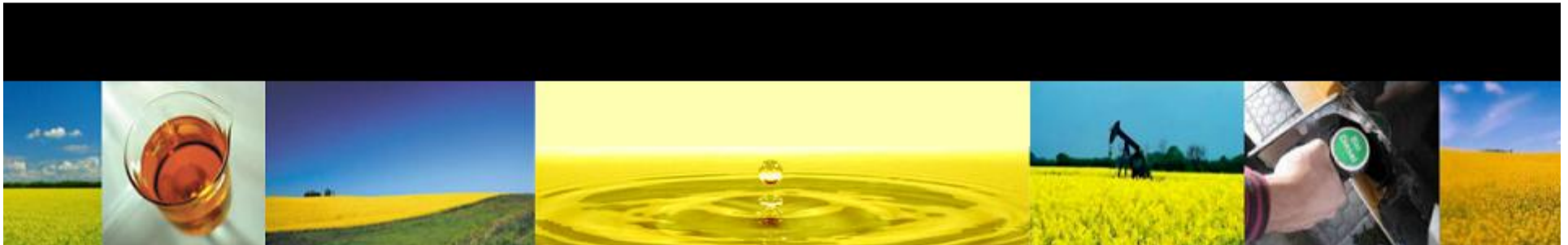
- Steel: carbon & stainless are best choice for above ground
 - * Galvanized steel problematic
- Non-metallic best choice for under ground
 - * Flex: must be UL listed for 100% ethanol/methanol.
 - * Remember: Vapor recovery systems
 - * Older FRP not compatible.
 - * FRP compatible after 88; fittings and glues would need to be verified on a case by case basis to determine compatibility.
 - * Ameron FRP not UL listed for alcohol until after 92, will not backed or supported until newer glues and fittings.
 - * AO Smith red thread all compatible.





Compatibility – Pipe Sealants

- Pipe dope has to be Teflon
- Alcohol based pipe sealant should be avoided.
- Suitable sealants include:
 - Scotch Brand Pipe Sealant with Teflon, No. 4178
 - Loctite Pipe Sealant with Teflon, No 592
 - Permatex Seals Pipes, No. 804
 - Gasoila 100





Where Do We Go From Here

Transition to Bio Fuels *(Four Step Process)*

- Evaluate the current equipment
- **Implement**
- Prepare to sell biofuels
- Maintenance & Upkeep

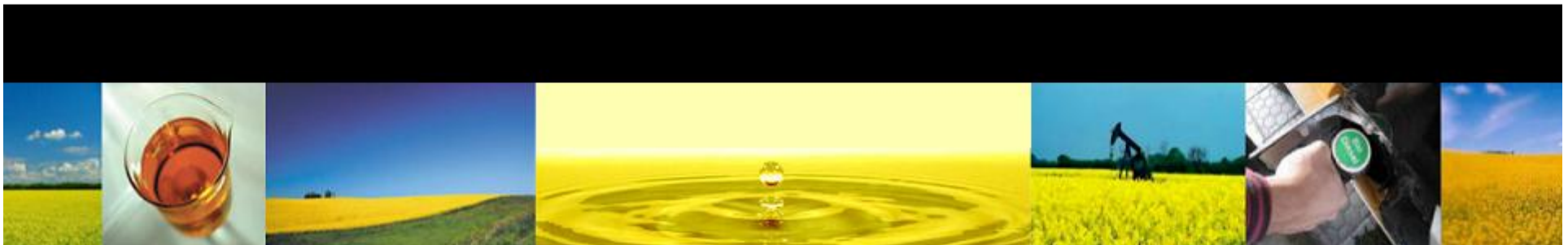




Bio Fuels Today

Implementation

- Clean the tank.
 - * *Product recirculation*
 - * *Optic Sweep*
 - * *Steam Cleaning.*
 - * *Filter Agitator.*
 - * *Chemical Solvents*
 - * *Robotic cannon*
- Install compatible equipment
 - * *Signage*



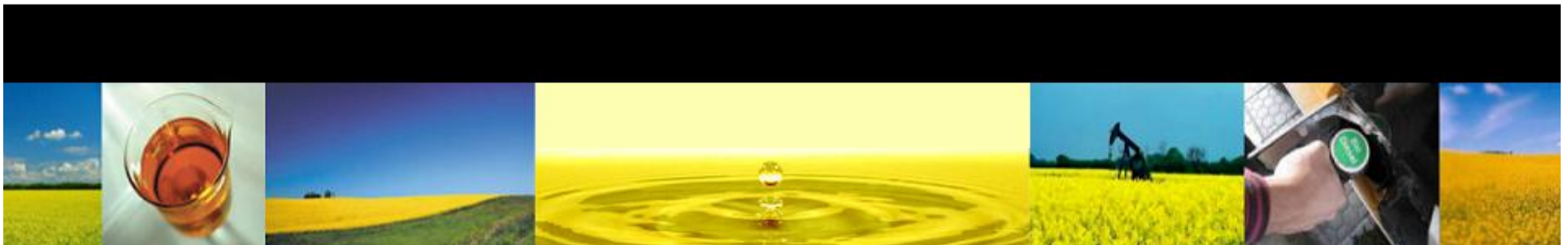


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Where Do We Go From Here

Transition to Bio Fuels (Four Step Process)

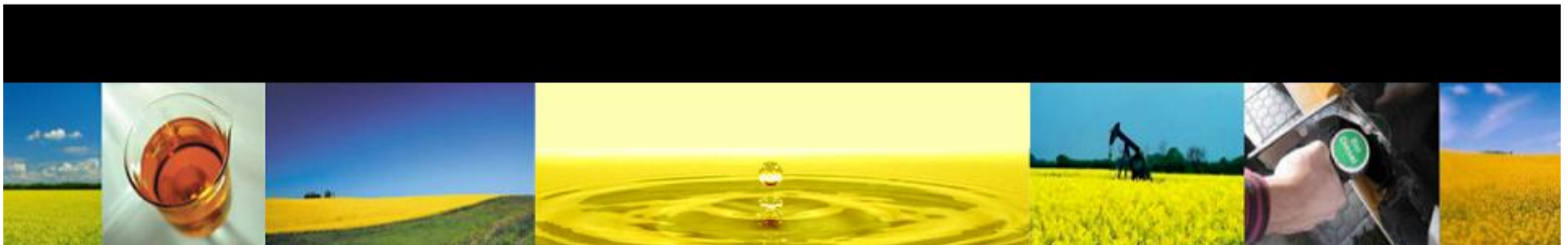
- Evaluate the current equipment
- Implement
- **Prepare to sell biofuels**
- Maintenance & Upkeep





Prepare to Sell BioFuels

- Check for water.
- Follow normal delivery procedures
- Shut down pumps during initial delivery.
- Purge lines from tanks to dispensers.
- Verify proper signage installed.
- Fill tanks to at least 80% of capacity.
 - * *Keep as full as possible for 7 to 10 days.*
- Test for water bottoms at the beginning of each shift for the first 48 hours after initial delivery. Then daily.
 - * *No level is acceptable.*
- Check pump calibration two weeks after initial load(s).

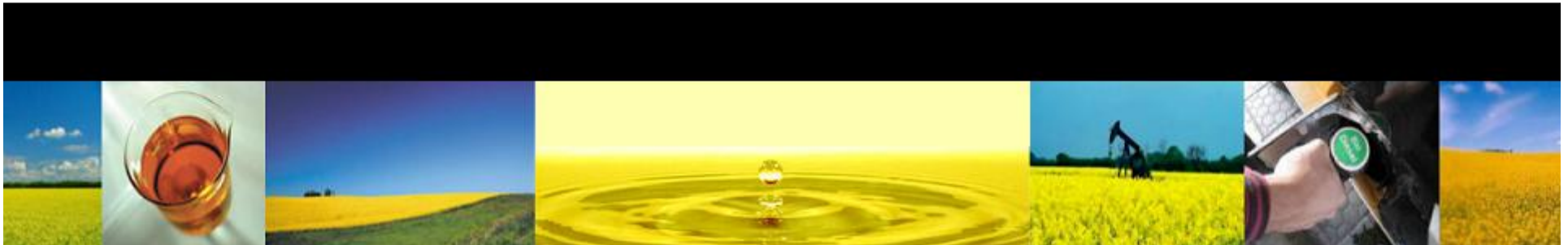




Where Do We Go From Here

Transition to Bio Fuels *(Four Step Process)*

- Evaluate the current equipment
- Implement
- Prepare to sell biofuels
- Maintenance & Upkeep





Maintenance & Upkeep

- Proper equipment use and maintenance is critical
- Filter changes
- Water removal
- Daily “walk-by” inspections
- Thorough record keeping is a must
 - * *Installations*
 - * *Conversions*
 - * *Inspections*
 - * *Tank & line testing*





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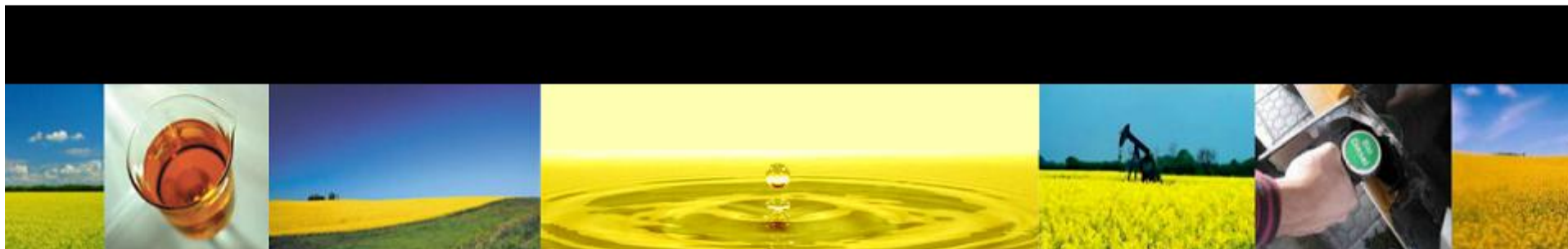
W: www.C200.com





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